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J. C. ADAMS, Esq. M.A., Fellow of St. John's College, Cambridge, President, in the Chair.

William Gray, Esq., York; and
J. W. Stephenson, Esq., 15 New Dorset Place, Clapham Road, were balloted for and duly elected Fellows of the Society.

The superintendent of the *Nautical Almanac* has printed an ephemeris of Encke's comet for January, February, and half of March 1852, and an ephemeris of *Victoria* during its opposition in January. Most of the observers who are likely to make use of these ephemerides are probably supplied with them by the kindness of the superintendent; but if any oversight has occurred, application may be made either directly to the *Nautical Almanac* office, or through Mr. Williams, our assistant-secretary.

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*New Planet discovered by Dr. A. de Gasparis.**

On Dec. 8, 1851, Professor de Gasparis discovered a faint planet in the vicinity of *Saturn*, of which the following are the approximate places:—

1851.	Naples M.T. h m s	R.A. s	Decl. ′ ″
Dec. 8	7 10 6·4	Saturn −31·7	Saturn −2 55
9	7 10 40·3	Saturn −30·5	Saturn −2 59

HAMBURG. (M. C. Rümker.)

1851.	Hamburg M.T. h m s	R.A. h m s	Decl. ° ′ ″
Dec. 24	7 8 4	1 45 32·37	+8 10 22·5

Brorsen's Fifth Comet (1851, *October* 22).

This comet has a bright nucleus, and a brilliant tail, more than 1° long.

1851.	Senftenberg M.T. h m s	R.A. h m s	Decl. ° ′ ″	
Oct. 22	8 3	13 39·4	+32 35·5	Approxim.
	17 17 13·5	13 42 1·3	+32 50 6	

"The latter place depends on a rather roughly reduced comparison with Bessel Z. 414; $13^h\ 43^m\ 18^s{\cdot}1 + 33^\circ\ 15'\ 43''$.

"The daily motion is $+6^m\ 16^s{\cdot}6$ and $+1^\circ\ 16'{\cdot}3$."

M. Brorsen adds in a postscript, "The comet has two tails; the less, as in Bessel's drawing, is turned to the sun."

* If the places here given refer to the same object, it must be, in all probability, a satellite of *Saturn*.

Observations.

LIVERPOOL. Equatoreal. (Mr. Hartnup.)

1851.	Green. M.T. h m s	R.A. h m s	Log $\frac{p}{P}$	N.P.D. ° ′ ″	Log $\frac{q}{P}$	Star of Comp.
Nov. 12	7 2 0·7	15 15 8·84	+8·726	46 21 58·9	−9·8358	B.A.C. 5157
17	6 12 6·5	15 33 54·23	8·751	44 54 71·4	9·7668	— 5287
	6 41 11·6	58·58	8·745	54 60·8	9·7986	— —
	7 14 11·3	63·77	+8·729	54 33·0	−9·8430	— —

The observations are corrected for refraction. P = the equatoreal horizontal parallax in arc, p = the correction for parallax in right ascension in time, and q = the correction in north polar distance in arc.

The following assumed *mean* places of the Stars of Comparison for 1851·0 were derived from the Oxford Observations.

	R.A. h m s	N.P.D. ° ′ ″
B.A.C. 5157	15 30 3·71	46 20 11·19
— 5287	15 49 40·16	46 25 27·75

"On the 12th further observation was prevented by clouds. The comet was very faint on the 17th. The nucleus on the 12th was steadily seen, generally as a very minute star, but occasionally, for intervals of a few seconds, it appeared quite bright, and had a rather large planetary disc. The tail was about 40′ long, and about 2′ broad in the widest part; it was directed from the sun, and was formed by the curvilinear rays of light proceeding from the nucleus and meeting at the end of the tail, which terminated in a point."

Elements.

By M. George Rümker.

Computed from the observations at Senftenberg, Oct. 22; at Vienna, Oct. 24; and at Berlin, Oct. 30.

Perihelion Passage, 1851, Sept. 30·66264, Berlin M.T.

	° ′ ″	
Longitude of Perihelion.....	339 46 4	App^{t} Eq^{x}.
— Node	41 38 30	Oct. 24, 1851.
Inclination	73 3 0	
Log q	9·214886	

Motion direct.

MM. Vogel and G. Rümker forwarded at the same time an approximate ephemeris from Nov. 8 to Dec. 2, inclusive.

PARTHENOPE.

HAMBURG. Equatoreal. (M. C. Rümker.)

1851.	Hamburg M.T. h m s	R.A. ° ′ ″	Decl. ° ′ ″
Oct. 17	9 44 35·7	29 51 42·1	+3 45 56·6
18	11 4 14·6	29 37 4·3	3 40 0·1
Nov. 2	8 3 22·7	26 14 45·8	+2 29 44·4

LIVERPOOL. Equatoreal. (Mr. Hartnup.)

1851.	Green. M.T. h m s	R.A. h m s	N.P.D. ° ′ ″	Stars of Comp.
Oct. 30	10 10 53·6	1 47 27·94	87 18 55·4	B.A.C. 518, 625
	10 40 48·3	26·88	58·1	— — —
Nov. 7	10 8 45·2	40 51·35	46 38·6	— 625
	10 28 41·9	50·79	40·3	— —
10	9 37 50·5	38 40·99	54 4·2	— —
	10 2 46·0	40·11	6·3	— —
12	10 16 28·9	37 18·38	87 58 6·2	— —
15	9 27 56·1	35 27·69	88 2 37·8	— —
	10 2 50·4	27·02	40·1	— —
17	9 38 53·7	34 20·15	4 38·5	— —
	10 8 48·8	19·42	40·4	— —
18	12 25 58·4	33 45·10	5 27·4	— —
	12 55 54·0	44·47	29·4	— —
21	9 5 17·5	32 24·78	6 19·1	— 448, 625
	9 55 9·6	24·12	18·0	— — —
22	8 38 59·9	1 31 60·18	88 6 10·4	— — —
	9 18 54·2	59·37	13·5	— — —

The observations are corrected for refraction and parallax. The log Δ for parallax was taken from the ephemeris of MM. Luther and Vogel.

The following assumed *mean* places of the Stars of Comparison, 1851·0, were derived from the Greenwich Observations.

	R.A. h m s	N.P.D. ° ′ ″
B.A.C. 448	1 22 22·92	84 37 33·78
— 518	1 33 40·82	85 16 6·48
— 625	1 54 20·49	87 57 28·08

HAVERHILL. (Mr. W. W. Boreham.)

1851.	Green. M.T. h m s	R.A. h m s	N.P.D. ° ′ ″	No. of Obs.	Star.
Sept. 22	10 17 55	2 17 35·92	83 53 17·5	4	*a*
28	9 36 42	14 26·80	84 24 39·0	5	*a*
29	10 11 22	13 49·32	30 21·8	5	*b*
Oct. 4	10 42 15	10 21·54	84 59 4·0	6	*b*
5	9 35 31	2 9 38·45	85 4 34·8	5	*b*
24	9 22 59	1 52 56·64	86 51 5·1	6	*c*
Nov. 2	8 11 36	1 44 56·91	87 30 20·6	6	*d*

The observations are corrected for refraction and parallax. The parallax is taken from MM. Luther and Vogel's ephemeris.

Mean places of Stars of Comparison.

Name.	R.A. h m s	N.P.D. ° ′ ″
a = Weisse, ii, 244	2 15 36·33	84 4 43·7
b = — – 192	2 12 33·86	84 48 11·3
c = Weisse, i, 962	1 53 55·47	87 2 10·9
d = Green. 12-yr. Cat. 169, III Piscium	1 45 50·70	87 33 2·9

Ephemeris (*continuation*). By MM. R. Luther and E. Vogel.

For 0h Berlin M.T.

1852.	R.A. h m s	Decl. ° ′ ″	Log Δ.	Time of Aberr. in Decimals of a Day.
Jan. 1	1 37 26·00	+ 4 15 45·1	0·300070	0·01139
2	38 4·24	22 4·2	·303015	01147
3	38 43·71	28 28·9	·305949	01155
4	39 24·43	34 59·2	·308872	01162
5	40 6·33	41 34·8	·311784	01170
6	40 49·43	48 15·5	·314685	01178
7	41 33·69	+4 55 1·1	·317574	01186
8	42 19·09	+5 1 51·7	·320451	01194
9	43 5·64	8 47·0	·323315	01202
10	43 53·30	15 46·7	·326165	01210
11	44 42·07	22 50·9	·329001	01218
12	45 31·92	29 59·3	·331824	01225
13	46 22·84	37 11·8	·334632	01233
14	47 14·81	44 28·3	·337425	01241
15	48 7·83	51 48·7	·340204	01249
16	49 1·87	+5 59 12·7	·342968	01257
17	49 56·91	+6 6 40·3	·345717	01265
18	50 52·95	14 11·4	·348450	01273
19	51 49·96	21 45·9	·351168	01281
20	52 47·94	29 23·5	·353869	01289
21	53 46·87	37 4·3	·356554	01297
22	54 46·74	44 48·1	·359221	01305
23	55 47·54	+6 52 34·6	·361870	01313
24	56 49·24	+7 0 23·9	·364502	01321
25	57 51·83	8 15·7	·367117	01329
26	58 55·31	16 9·9	·369714	01337
27	1 59 59·63	24 6·4	·372294	01345
28	2 1 4·79	32 5·0	·374855	01353
29	2 10·79	40 5·6	·377399	01361
30	3 17·61	48 8·1	·379924	01369
31	4 25·23	+7 56 12·5	·382431	01377
Feb. 1	5 33·64	+8 4 18·5	·384919	01385
2	6 42·83	12 26·0	·387389	01393
3	7 52·77	20 35·0	·389840	01401
4	9 3·46	28 45·2	·392273	01409
5	10 14·89	36 56·7	·394687	01416
6	11 27·04	45 9·3	·397083	01424
7	12 39·91	+8 53 22·8	·399460	01432
8	13 53·48	+9 1 37·2	·401818	01440
9	15 7·55	9 52·4	·404157	01448
10	2 16 22·69	+9 18 8·3	0·406478	0·01455

1852.	R.A. h m s	Decl. ° ′ ″	Log Δ.	Time of Aberr. in Decimals of a Day.
Feb. 11	2 17 38·31	+9 26 24·8	0·408789	0·01463
12	18 54·61	34 41·7	·411064	01471
13	20 11·56	42 59·1	·413328	01478
14	21 29·16	51 16·8	·415574	01486
15	22 47·41	+9 59 34·8	·417801	01494
16	24 6·29	+10 7 53·0	·420009	01501
17	25 25·79	16 11·2	·422198	01509
18	26 45·91	24 29·4	·424368	01517
19	28 6·64	32 47·4	·426519	01524
20	29 27·94	41 5·3	·428651	01532
21	30 49·87	49 22·8	·430764	01539
22	32 12·35	+10 57 39·9	·432857	01546
23	33 35·41	+11 5 56·6	·434931	01554
24	34 59·04	14 12·6	·436987	01561
25	36 23·21	22 28·0	·439024	01569
26	37 47·92	30 42·6	·441041	01576
27	39 13·17	38 56·3	·443039	01583
28	40 38·94	47 9·0	·445017	01590
29	42 5·23	+11 55 20·7	·446977	01598
March 1	43 32·02	+12 3 31·2	·448918	01605
2	44 59·31	11 40·4	·450840	01612
3	46 27·09	19 48·5	·452742	01619
4	47 55·36	27 55·1	·454626	01626
5	49 24·10	36 0·4	·456492	01633
6	50 53·31	44 4·0	·458339	01640
7	52 22·99	+12 52 6·1	·460168	01647
8	53 53·13	+13 0 6·6	·461978	01654
9	55 23·71	8 5·2	·463770	01661
10	56 54·75	16 2·1	·465543	01667
11	58 26·23	23 57·1	·467298	01674
12	2 59 58·16	31 50·1	·469035	01681
13	3 1 30·52	39 41·3	·470753	01687
14	3 3·31	47 30·3	·472453	01694
15	4 36·53	+13 55 17·3	·474135	01701
16	6 10·17	+14 3 2·0	·475799	01707
17	7 44·22	10 44·5	·477445	01714
18	9 18·67	18 24·7	·479073	01720
19	10 53·53	26 2·4	·480682	01726
20	12 28·79	33 37·7	·482273	01733
21	14 4·43	41 10·5	·483846	01739
22	15 40·47	48 40·7	·485401	01745
23	17 16·88	+14 56 8·5	·486938	01752
24	3 18 53·67	+15 3 33·4	0·488457	0·01758

1852.	R.A. h m s	Decl. ° ′ ″	Log Δ.	Time of Aberr. in Decimals of a Day.
March 25	3 20 30·83	+15 10 55·5	0·489958	0·01764
26	22 8·35	18 14·8	·491441	01770
27	23 46·21	25 31·0	·492906	01776
28	25 24·43	32 44·2	·494353	01782
29	27 2·99	39 54·4	·495782	01788
30	28 41·88	47 1·6	·497194	01793
31	30 21·11	+15 54 5·5	·498588	01799
April 1	32 0·65	+16 1 6·2	·499965	01805
2	3 33 40·51	+16 8 3·6	0·501325	0·01811

EUNOMIA.

HAMBURG. (M. C. Rümker.)

1851.	Hamburg M.T. h m s	R.A. ° ′ ″	Decl. ° ′ ″
Oct. 4	7 52 53·1	278 5 24·3	−21 43 43·8
8	7 4 14·0	279 10 12·0	21 29 50·3
18	6 58 4·2	282 10 41·7	20 52 24·7
25	6 46 19·8	284 29 49·3	−20 24 45·7

EGERIA.

Ephemeris (continuation).* By M. G. Rümker.

12h Berlin Mean Time.

Date. 1852.	R.A. h m s	Decl. ° ′	Log Δ.	Date. 1852.	R.A. h m s	Decl. ° ′	Log Δ.
Jan. 1	12 14 2	+19 58·8	0·28730	Jan. 17	12 23 14	+20 33·9	0·24799
2	14 49	+19 59·7		18	23 34	37·4	
3	15 34	+20 0·7		19	23 52	41·0	
4	16 17	1·9		20	24 9	44·9	
5	16 59	3·3	0·27741	21	24 24	48·8	0·23842
6	17 39	5·0		22	24 37	52·9	
7	18 18	6·9		23	24 48	+20 57·1	
8	18 55	8·9		24	24 57	+21 1·6	
9	19 30	11·1	0·26754	25	25 5	5·9	0·22909
10	20 4	13·4		26	25 10	10·5	
11	20 36	15·9		27	25 14	15·2	
12	21 6	18·6		28	25 15	20·0	
13	21 35	21·3	0·25772	29	25 15	24·9	0·22011
14	22 2	24·2		30	25 13	29·9	
15	22 28	27·3		31	12 25 8	+21 35·0	
16	12 22 52	+20 30·6		Feb. 1	12 25 1	+21 40·2	

* From Professor Encke's elements, *Berliner Jahrbuch*, 1854.

Date. 1852.	R.A. h m s	Decl. ° ′	Log Δ.	Date. 1852.	R.A. h m s	Decl. ° ′	Log Δ.
Feb. 2	12 24 52	+21 45·5	0·21159	Feb. 17	12 18 47	+23 9·4	
3	24 41	50·8		18	18 7	14·9	0·18395
4	24 29	+21 56·2		19	17 26	20·3	
5	24 14	+22 1·7		20	16 43	25·7	
6	23 58	7·2	0·20365	21	15 58	31·0	
7	23 39	12·8		22	15 12	36·2	0·19791
8	23 18	18·4		23	14 24	41·2	
9	22 56	24·0		24	13 35	46·2	
10	22 33	29·7	0·19635	25	12 44	51·0	
11	22 7	35·4		26	11 51	+23 55·7	0·17528
12	21 38	41·1		27	10 57	+24 0·2	
13	21 8	46·8		28	10 1	4·6	
14	20 36	52·5	0·18975	29	9 4	8·8	
15	20 1	+22 58·2		Mar. 1	12 8 6	+24 12·9	0·17253
16	12 19 25	+23 3·8					

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*Note on the Planet Victoria.** By M. Yvon Villarceau.

"The ephemeris of the third planet discovered by Mr. Hind, which I have calculated for every day during six months and a half, depends on the observations during forty-three days. In publishing it, I presented at the same time a comparison of the meridian observations of Paris with my ephemeris. The observations of other astronomers during the whole period agree as well as I could expect with the ephemeris, the maximum errors being $0^{s}\cdot66$ in R.A. and $7''\cdot4$ in declination.

"To obtain still greater accuracy, I have represented, graphically, the comparisons published by MM. Hartnup, Carrington, Vogler, and Graham, along with those of the observatories of Paris and Cambridge. I have also deduced comparisons from three months' observations made at Washington and collected by Mr. Ferguson. In this way I have constructed nearly 200 ordinates in right ascension and as many in declination, representing the excess of observation above the computations of the ephemeris. Through each of these series of points I have drawn a continuous curve, contenting myself, however, for the first forty days with satisfying, as far as was possible, the Paris meridian observations; and for the rest of the time, with satisfying the observations of Mr. Hartnup. My reasons for this preference are, the great accordance of the Paris observations, with one or two exceptions; and that Mr. Hartnup, whose observations also agree well together, has referred the planet to well-determined stars.

* M. Villarceau has used the name *Clio;* but Mr. Hind, the discoverer, in the exercise of his undoubted right, has selected the name of *Victoria*, a well-established heathen goddess.

"Taking the ordinates of the two curves for the excess of the observations above the ephemeris, and adding this excess to positions deduced from the ephemeris, I have obtained the fourteen normal positions set down in the following table:—

For Paris Mean Noon.

	Observed—Calculated. R.A.	Decl.	Normal Positions. R.A.	Decl.
1850.	s	"	h m s	° ′ ″
Sept. 18	−0·11	0·0	23 41 1·26	+13 26 42·6
30	·08	+0·2	31 48·31	11 21 41·7
Oct. 12	−0·05	0·8	25 19·75	9 9 39·2
24	+0·04	1·5	23 0·18	7 13 26·0
Nov. 9	·25	2·7	25 6·70	5 46 39·3
17	·42	4·2	31 19·85	5 54 18·2
29	·54	5·3	40 58·47	4 35 4·6
Dec. 11	·61	6·4	23 53 22·03	4 44 51·8
23	·66	7·1	0 7 53·90	5 18 38·8
1851.				
Jan. 10	·61	7·3	32 39·55	6 43 11·9
25	·45	7·0	0 55 16·49	8 15 6·0
Feb. 9	·28	6·9	1 19 12·46	9 58 24·3
24	+0·08	7·0	1 44 8·27	11 46 40·6
Mar. 11	−0·06	+7·4	2 9 51·98	+13 24 32·0

M. Villarceau then explains his mode of correcting the elements by means of the normal places, and deduces the following *corrected* elements, which represent the observations very closely:—

Mean Anomaly	65 46 47·36	1851, Jan. 0·0, Paris M.T.
Long. Perihel.	301 55 17·57	Mean Equinox, 1851, Jan. 0.
— Asc. Node	235 29 31·41	
Inclination	8 23 6·78	
Angle (sin = excentricity)	12 36 11·58	
Mean Daily Helioc. Motion	994″·43246	
Semi-axis Major	2·3350032,	log = 0·3682875
Excentricity	0·2181980	
Sidereal Period. Time	3y·5680582	

"The differences between these elements and the normal places are very small. Part of the differences may arise from the uncertainty of the graphical interpolation, which is caused in a great measure by the errors of the observations.* The errors of the tables of the sun and the effects of perturbation must also be taken into

* "These errors are largest in right ascension, both in the meridian and equatoreal observations, which is probably owing to the difficulty of illuminating the telescope where such faint objects are observed. It seldom happens that a small planet can be observed in position and distance like a double star. We may expect that the powerful meridian instrument, which Mr. Airy has recently erected at Greenwich, will not present the great discordances in right ascension which are now found in the observations of the faint planets."

account. From the systematic march of the errors, I should be inclined to suppose them due to perturbation.

"I will avail myself of the present opportunity to make a remark on the construction of my ephemeris of *Victoria*. The linear co-ordinates of the sun, taken from the *Nautical Almanac*, have been, as I have mentioned elsewhere, corrected for the terms depending on the sun's latitude. But M. Schumacher communicated to me a remark made by M. Götze, that these co-ordinates have been calculated with a radius vector of the earth, *affected with aberration*. I have only attended to this remark in that part of the ephemeris which belongs to the first three months of 1851. The rectilineal co-ordinates of the sun are so very convenient in use that it is desirable the superintendent should take the preceding remark into consideration; since the *Nautical Almanac* is a work which every astronomer must daily use, and whose merits every astronomer must highly appreciate."

Observations of the Planet Saturn with the 20-foot Equatoreal.
By Mr. Lassell.

"*September* 9, $11\frac{1}{2}$ p.m. The phenomena of *Saturn* were extremely well shown, the air being in an unusually fine state, though some unsteadiness still remained. Power 430. The division of the ring easily visible along the whole of that part of the ring between us and the ball. No other division could be made out certainly. The more dusky surface of the exterior ring gave a striped impression, but no certain line. The 'veil' extended exactly half way from the inner boundary of the inner ring to the nearest edge of the ball. The termination of it was well defined towards the ball, and the sky within it perfectly black, as much so as any part of the sky. But the exterior boundary, though pretty well defined, was less so than the interior; and beyond its evident termination there was a faint but very evident shade upon the ring. No difference in depth of shade of the 'veil' could be suspected, and certainly no dark division separating it into two, neither could any darker division be made out between the 'veil' and the bright ring. Once, for an instant, I suspected a darker boundary, but the impression did not return. Certainly the planet is seen to-night to such advantage, that, if such divisions exist, I think I ought to see them. The shadow of the ball on the ring seemed to be bounded by a straight, not a curved line—or if curved at all, it is concave towards the ball. I could not well trace the dark shade crossing the ball in a continuous line to the dark shade within the ring—it seemed as if the sky dipped down into it, then encroaching upon it and reducing its breadth at those points where the planet's limb touches (apparently) the ring. The faint shading on the bright ring may be traced (growing gradually fainter) to within less than the breadth of the exterior ring of its outer circumference. The

satellite *Mimas* was steadily seen, even when considerably past his greatest western elongation.

"*September* 10. I surveyed *Saturn* from $11\frac{1}{2}^h$ to 13^h with various powers, *e.g.* 366, 430, 614, and 864, the air being occasionally remarkably fine, so as to exceed the atmosphere of last night, and give me the most exquisite glimpses of the phenomena of the planet. The drawing which accompanies this paper is the most faithful picture I have been able to execute of the appearances which presented themselves. I am confirmed in my impression that there is no difference in the deepness of the shade of the dusky ring or 'veil'—that it is not obviously separated into two, and that there is no black line or division of sensible breadth separating it from the bright ring. The breadth of the veil, where it crosses the planet, is about the breadth of the inner bright ring at the same point—it ought to be not quite so broad, but the lighter shading on the interior portion of the inner bright ring may modify the judgment. The shadow of the ball on the ring is *slightly* concave towards the ball; nothing extraordinary in the *shape* of the shadow.

"I had many sharp glimpses of the outer ring, even with the high powers, and its outline was perfectly sharp and distinct; but no positive division could anywhere be traced, notwithstanding that this was, taken altogether, the most powerful view of *Saturn* I ever had. The plane of the exterior ring was strongly shaded parallel to its circumference, so as to give an impression of divisions; but I believe they were not real—only markings on the surface. The satellites *Mimas* and *Enceladus*, seen in the positions depicted in the drawing, strongly show the power of the telescope and the goodness of the circumstances. At 12^h 30^m *Mimas* was nearly over the preceding end of the ring; and *Enceladus* was very little short of his apparent conjunction south of the ball. In this position they were seen steadily and well with power 864, and without any contrivance to hide the splendour of the planet.

"*September* 12*th*. Most extraordinarily, to-night is also fine, making the fourth of almost unprecedented beauty. Two friends observing with me prevented my noting down the phenomena, as on the 9th and 10th, at the time of observation; and the record of what I saw was made on the following morning. About 11^h the telescope was turned upon *Saturn*, and we surveyed him with various powers, viz. 430, 560, 614, and 864, as the increasing altitude of the planet allowed us to see him through a thinner medium. The night was excessively dewy, the fields being covered with fog up to the tops of the hedges; and indeed the whole sky up to within a little of the zenith was hazy or foggy. This, however, cleared off later in the night, and from 13^h to 14^h *Saturn* appeared with unequalled beauty. *Enceladus* was watched up to the moment of his apparent inferior conjunction, which I estimated to take place at 13^h 59^m G.M.T.

"My impressions received this evening confirm in the fullest manner those described in the observations of the 9th and 10th

instants. I could not perceive that there was any shading of deeper intensity than the rest in any part of the obscure portion of the ring, which I have usually called the 'crape veil.' Under the singularly favourable circumstances of these three evenings, (the state of the air being almost unprecedented, and the telescope with 20 and 22 inches aperture leaving nothing to desire in sharpness of definition), my attention has been directed in the most concentrated manner to the structure of the recently observed appendage of *Saturn*, which has been called the dark ring; and I arrive deliberately at the following conclusions:—That there is no evidence to me of any *division* between the 'crape veil' and the anterior portion of what has been hitherto considered the inner ring; though there is a faint shading, which begins about the middle of the bright inner ring, deepening towards the 'veil;' but even when it touches it, it is much less dark than the 'veil,' and it touches it without the intervention of any black division or sky between. And a careful survey of the whole surface of the veil on both sides of the ball shows me no irregularity of depth of shade, much less any *division* separating it into two.

"To perpetuate the impression of these telescopic visions of the planet I made a drawing of it as it appeared on the 10th of September, accompanied by the nearest two satellites. Of this drawing I have had a lithographic copy made, with as much faithfulness as I have been able to secure, some impressions of which accompany this paper.

"I must, however, acknowledge that it falls short of the beauty of the telescopic image; the drawing of the several ellipses of the boundaries of the rings not being quite symmetrical, especially the exterior outline on the north preceding side. The belt on the ball is also a little too dark, and its edges too hard. In other details it is pretty faithful; the kind of edge which appeared to me to form the exterior boundary of the veil, especially so."

On the Planet Saturn and his Rings. By Mr. Dawes.

"The night of October 26th (up to about $11^h 45^m$, when it suddenly clouded) was remarkable for distinctness of definition; and I employed part of it in examining the planet *Saturn* with high powers on my $8\frac{1}{2}$-foot refractor. The results of the scrutiny were in some respects different from what I had ever seen before, and I hope they will not be uninteresting to the Society.

"The sky was hazy, the stars shining with a dim lustre ('*stellis acies obtusa*'). But on turning the telescope upon *Saturn*, I was struck with the beauty of the definition. A power of 585 (determined by measuring the emergent pencil) was borne with admirable distinctness, and the phenomena observed were as follows:

"On the *outer bright ring* was steadily visible a *very narrow*

black line, a little exterior to the middle of the ring. It appeared to be far too dark, narrow, and sharply defined to be merely a shading or belt; and gave the decided impression of being a division of the ring. This I had seen, but less perfectly, on September 11th; and I have had glimpses of it on other nights.

"The *principal division* between the bright rings was steadily seen throughout its whole extent till lost behind the ball; and was beautifully black and sharply defined.

"But the most remarkable appearances were observed on the *inner bright ring*. Its exterior portion to about one-fourth of its whole breadth was very bright, being of about the same colour as the brilliant zone on the ball immediately to the north of *Saturn's* equator. Interior to this, the shading off did not appear, as under ordinary circumstances, to become deeper towards the inner edge *without any distinct or sudden gradations of shade*. On the contrary, it was clearly seen to be arranged in a series of *narrow concentric bands*, each of which was somewhat darker than the next exterior one. Four such were distinctly made out. They looked like *steps* leading down to the black chasm between the ring and the ball. The impression I received was that they were *separate rings*; but too close together for the divisions to be seen as black lines. The slightest undulation of the image was sufficient to confuse the different shadings, and to destroy the step-like appearance.

"Immediately interior to the inner edge of the bright ring was a *black elliptic line*, forming a distinct separation between the bright and the faint rings. This I have satisfactorily made out on several good nights during both the last and the present apparition of the planet, and especially on the 11th of last September, which was here remarkably fine; but never before with such perfect steadiness as on the present occasion. I could trace it, occasionally, along the inner edge of the bright ring, fully half-way to the ball.

"The *exterior faint ring* was pretty steadily visible, though very faint to-night from the dull condition of the planet. Yet occasionally, for several seconds together, both its outer and inner edge were distinctly seen;—the inner edge being distant from the inner edge of the bright ring about one-third of the interval between that edge and the ball.

"From the thick state of the air, the *interior faint ring*, of whose separate existence I satisfied myself last winter, was only occasionally seen. On several previous nights, however, during the present autumn, I have seen it far better, as, from its excessive faintness, it requires clear air as well as good definition. On September 11th I had an excellent view of it, and it was then seen to extend very nearly, if not quite, to the middle of the interval between the bright ring and the ball. I have never, I believe, obtained a glimpse of it beyond this.

"Where the ring crosses the ball, the *shadow of the ring* appeared as a very narrow black line contiguous to the *northern* edge of the ring. At the southern edge of the same portion of the ring,

the projection of the faint rings on the bright zone of *Saturn* appeared, I thought, as black as the shadow itself; being considerably broader, and seen in contrast with the most brilliant portion of the planet; while the *shadow* was thrown upon the belt-like cap which covers the northern part of the ball.

"The superiority of exquisite definition with only a moderate quantity of light, in bringing out the minutiæ of planetary surface, over a far greater brilliancy of the object with less perfect distinctness, was strikingly exemplified by the observations of October 26. On that night *Saturn* had not half its usual brilliancy; yet, with the exception of the faint rings, no part of the planet appeared to be deficient in light; on the contrary, with an emergent pencil less than $\frac{1}{90}$th of an inch in diameter, its image in the telescope when best seen possessed the distinctness of an engraving.

"So peculiarly attractive as the planet *Saturn* has always been to telescopic observers, with large instruments especially, it seems almost unaccountable that the appearance of *a dark line on the ball at the interior edge of the ring, while the shadow of the ring was evidently thrown to the other side of it*, often as such a state of things must have been visible, should not long ago have suggested the existence of a dark interior ring; for this seems to be the only hypothesis capable of accounting for such an appearance: and it would have been perfectly tenable if no evidence of the existence of such a ring had been found in the light, now obvious enough, in the interval between the bright ring and the ball."

Notice of Saturn and his Rings. By Mr. Isaac Fletcher.

"On several very fine nights towards the close of October last, I carefully examined the planet *Saturn* with my 6-foot equatoreal of $4\frac{1}{7}$ inches aperture, and on every night I distinctly and steadily saw the new obscure interior ring, which was discovered last year by Messrs. Bond and Dawes. On each occasion I estimated its breadth at almost exactly one-third of the space between the inner edge of the bright ring and the planet. Its colour to my eye is a *dusky grey*. In all the observations a power of 300 was found most efficient. Of the division of the outer ring my telescope afforded no evidence whatever. This, of course, I anticipated from its limited aperture.

"On the 12th of this month (November) I paid a visit to my friend Mr. Pattinson, of Scots House, near Newcastle-upon-Tyne; and about 8 o'clock in the evening we directed Mr. Pattinson's equatoreally mounted achromatic telescope of $10\frac{1}{3}$ feet focus, and $7\frac{1}{4}$ inches clear aperture upon *Saturn*, and subjected the planet to a rigorous scrutiny. At this hour the state of the atmosphere was exceedingly favourable for delicate observation; and with powers 400 and 440 the definition of the planet and rings was almost perfect, the outlines being exceedingly hard and sharp. The presence of the moon was of course unfavourable for seeing very faint

objects; notwithstanding this, however, the interior obscure ring was obvious and distinct, but we had no evidence of its being multiple. In moments of best vision Mr. Pattinson and I were both quite satisfied of the existence of a very *narrow*, *faint line* on the outer ring; and we were both of the opinion that this line was nearer to the *outer* than to the inner edge of the ring. This line was only visible at intervals, and after the most steady gazing; nevertheless, the evidence obtained was sufficient to satisfy us of its existence. In a short time, the state of the atmosphere deteriorated very considerably, and we were unable to obtain any further views of this faint line, which may fairly be assumed to be a *division* in the outer ring.

"I am induced to make this communication to the Royal Astronomical Society, not because it contains any *new facts*, but because it confirms in some important particulars the observations of other astronomers. Mr. Pattinson's equatoreal is a recent specimen of the skill of Mr. Cooke of York."

Note on the Appearance of Saturn and his Rings.
By Mr. W. De la Rue.

"I have had an opportunity of observing *Saturn* since my return from Paris, and of making a sketch of its present aspect. In a few days I hope to complete a drawing, and will send it for inspection to the Royal Astronomical Society.* The time of observation was between the 12th and 15th hour of the 13th August, one of the finest nights I have ever had, notwithstanding a very slight haze illumined by the bright moonlight.

"The division between the two principal rings was as black as if drawn with ink, and extended quite up to the shadow of the planet on the ring: the details, that is, the light and dark portions of the two rings, were seen very beautifully with all the powers employed from 150 to 450.

"Four satellites were visible, one so close to the southern pole of the planet that I believe it to be the first or nearest.

"The *dark* ring was very fine, its inner edge being perfectly sharp and well defined, and extending much nearer to the planet than it appeared to me to do when I made my last drawing; the circumstances, however, were much more favourable on this occasion, the atmosphere remaining steady for several seconds at a time, which enabled me to observe much more calmly, and, consequently, to make a less hurried sketch. The real shadow of the rings on the planet was only a very narrow black line; the dark ring crossing the planet was not nearly so black as the division between the two principal rings.

"Lastly, the shadow of the planet on the dark ring was curved.

"P.S. No division was visible in the dark ring, which was quite uniform in colour."

* An exquisite drawing by Mr. De la Rue was sent with the above account.

On the Interior Satellites of Uranus. By Mr. Lassell.

Extract of a letter dated Nov. 13, 1851 :—

" After a ten-day painful exercise of patience, I obtained last night, still under great disadvantages, another view of the two new satellites of *Uranus*. The sky was so generally cloudy and always hazy through the whole of last night, that I could get no absolute measures (save one) of either position or distance of either even of the bright satellites; though I managed to get a view of both the close ones, and also as good estimations of their situations with respect to the bright ones, as convinced me that no great error of position could exist. In default of measures, I estimated the position of IV to be 5°, and of III to be 110°. I afterwards obtained a single rough measure of III which gave, position 112° 34′; 2 was estimated, in distance *fully* six-tenths of the distance of III; 1 was decidedly closer, and barely one-third of the distance of IV : 2 obviously brighter than 1, as it also was on the 2d November. I made a diagram of the positions of the four satellites in my observation book with as much care as possible; and I inclose you a copy of it reduced to a scale of $1'' = 0{\cdot}05$ inch, the angles of position being deduced by the application of a protractor. I ought to add that, in order to avoid the possibility of prejudice, I entered into no calculation whatever of the expected positions of the satellites, until all was written down in my book, and I had come in from the observatory. I had, indeed, at the time of observation, no knowledge which was the most likely quadrant of location of any of them. The powers used were 614 and 760, and the epoch $10^h\ 30^m$."

Mr. Lassell finds that a periodic time of 2·506 days will satisfy the place of 1, and a period of 4·150 days the place of 2, and that the estimated elongations agree pretty fairly with the elongations calculated from the periodic times.

" It may, however, be necessary to say a word in reference to M. Otto Struve's, and indeed my own former observations of an interior satellite or satellites (see *Monthly Notices*, 14th January, 1848, and 10th March, 1848). I confess I never thought my own observations sufficiently connected and definite to be worthy of the very ingenious and elaborate discussion given by my friend Mr. Dawes as the basis (in conjunction with M. Struve's observations) of an assumption of periods for three interior satellites. And, indeed, in the memoirs of both these distinguished astronomers, various suppositions are necessarily introduced to account for what would otherwise be irreconcileable observations.

" I cannot, indeed, assert that *Uranus* has no interior satellites besides these two; but I feel very confident, that if they exist, they must be very much fainter than either 2 or 1 (which I now observe easily in good circumstances) or they could not have escaped my notice. It appears to me that the most probable hypothesis to explain M. Otto Struve's and my own former observations, is to conclude that we sometimes observed one satellite and sometimes the

other; especially as 1 is generally brighter than 2, and if near its greater elongation might be seen when 2 otherwise situated would be invisible. This would explain the difficulty of reconciling the observations."

Extract of a letter dated Nov. 29, 1851 :—

"It is rather remarkable that, since I first saw these satellites, I have never looked for them without seeing them, though on some occasions, *e.g.* Nov. 21, the 2d, always the faintest, was recognised with most extreme difficulty. I inclose a tracing of the diagrams made on four more evenings, viz., up to Nov. 22, which, compared with the observations of the 2d, give periods of 2·509 days = $2^d\ 12^h\ 13^m$, and 4·126 days = $4^d\ 3^h\ 1^m$ respectively. I have not yet been able to measure their distances directly and absolutely from the centre of the planet, as its brightness, when fully in the field, always either entirely extinguishes them or renders it impossible to apply the micrometer. I shall, however, if I am not soon favoured with weather sufficiently fine for this purpose, measure the faint ones from the bright ones, and in this way get at their distances. Hitherto all the fine sky I have had has been used in measuring the positions and distances of the old satellites, of which I am getting as many measures as I can during this apparition, with as much accuracy as possible; and when I have finished the series I will send them to the Society. I have also not quite neglected *Neptune*; but I wait also to complete his series. While observing *Uranus* I shall also carefully scrutinise all his neighbourhood, at least within 4′. I may mention that on the 2d inst., the *motion* of 2 in overtaking IV was evident during observation. When first seen it was sensibly short of the line joining the planet's centre and IV, and when last seen it was just perceptibly beyond it. In the various quadrants in which these satellites have been seen, I observe no difference of brightness which cannot be accounted for by their greater or less distance from the planet. I have certainly seen the nearest when within 10″ or 11″, and, therefore, have not found Sir W. Herschel's remark hold (in my experience), that the satellites generally disappeared when they came within about 22″ of the planet. I suppose the greatest elongations of 1 and 2 are now somewhere about 13″ and 18″, and therefore they never can come near Sir William's limits of visibility. I am led to presume that the flare round the planet in his telescope must have been the cause of the satellite not being seen within 22″. In my own telescope I have found differences in this kind of scrutiny which I can only attribute to the state of the air. Sometimes the satellites are more easily measured, and are better seen with the full aperture than with any diminution; and at others, 20 inches shows the close satellites more obviously. I attribute the sudden detection, and frequently repeated observation of these minute and close objects, to the superior action of my mirror under its recently applied system of lever support; it now defines better and brings out with more vividness and concentration minute points of light. The steadiness with which *Mimas* is seen, when

near its greatest elongation, with a power of 400 or 500, notwithstanding the splendour of *Saturn* and its widely-opened ring full in the field, is a proof of this."

*Table of Mr. Lassell's Observations of the Interior Satellites of Uranus.**

1851.	h m		Position. ° ′	Distance. ″
Nov. 12, at	10 30	IV	5 est.	
		III	112 30	
		2	131	
		1	332	
Nov. 17	10 30	IV	220 12	34·63
		III	257 34	24·09
		2	47	13
		1	337	12
Nov. 18	12 0	IV	191 6	36·83
		III	202 est.	
		2	316	13
		1	186	12
Nov. 21	11 44	IV	131 57	34·29
		III	91 7	21·38
		2	63	10
		1	123	12
Nov. 22	11 36	IV	101 32	
		III	38 50	
		2	329	17
		1	332	12

" Pray mention in the next *Monthly Notice* that in the diagram of the satellites of *Uranus*, vol. xi. p. 247, the words *north* and *south* should *change* places. The additional motion applied to my polishing machine answers well, but requires more attention than I think any body else would give. I wait to make some further trials before I announce it. I have looked twice for D'Arrest's comet with the aid of Mr. Pogson's ephemeris: the circumstances were not very favourable, and I failed to detect it."

D'ARREST'S COMET.

Elliptic Elements. By M. Yvon Villarceau.

" I have employed five observations made at Leipsic and Berlin between June 29 and July 6, and two observations made at Paris July 27 and August 3. The latter is rather doubtful, and I have only employed it from the impossibility of getting others without too great delay.

* The position of IV on Nov. 12 is *estimated*, as is the position of III on Nov. 18; the other positions of IV and III and the distances have been measured. The positions of 2 and 1 are given by Mr. Lassell from their configurations with the planet and brighter satellites; the distances are taken from Mr. Lassell's diagram according to his scale.

" A first trial showed me that a satisfactory result could not be deduced by using a method applicable to three observations, which is owing to the very small geocentric latitudes of the comet. The method which I have given for planets in the Additions to the *Connaissance*, 1852, is perfectly suited to this occasion.

Perihelion Passage, 1851, July 8·97942, Paris M.T.

Long. Perihel.	324 10 26·7	Mean Eq.
Ascending Node	149 21 52·2	July 9.
Inclination	14 14 40·7	
Angle (sine = excentricity)	44 43 3·1	
Mean Daily Heliocentric Motion	443·7415	

" Hence we have,

Perihelion Distance	1·185163, log = 0·0737781
Excentricity	0·7036121
Semi-axis Major	3·99869, log = 0·6019177
Sidereal Revolution	7·99608 years.

" The elements represent the observations pretty fairly, though they are liable to considerable modification from future observations. It is scarcely probable that the *periodic* nature of the comet should be changed.

" I, too, had made the remark, which was suggested to the Academy of Sciences by M. Benjamin Waltz, that this comet might probably be the same as the comet of 1678 calculated by Douwes. But I think the perturbations during the interval must be computed before we can pronounce this identity to be proved."

Mr. Norman Pogson, who was lately engaged at Mr. Bishop's Observatory, and is now attached to the Radcliffe Observatory, had the kindness to compute a daily ephemeris of D'Arrest's comet, from the last corrected elements by Dr. D'Arrest, for the interval between Nov. 21 and Dec. 6, 1851. This ephemeris was forwarded to the possessors of powerful telescopes, Mr. Lassell, Professor Challis, &c., in the hope of obtaining some additional observations. Unluckily, from the state of the weather or the faintness of the comet, Mr. Pogson's zeal has not been rewarded by the rediscovery of the comet.

BRORSEN'S FOURTH COMET (1851, *August* 1).

HAVERHILL. (Mr. W. W. Boreham.)

1851.	Green. M.T. h m s	R.A. h m s		N.P.D. ° ′ ″		No. of Obs.	Star.
Aug. 13	9 47 46	14 17 15·03	+0·049 *p*	53 1 42·5	−0·53 *p*	3	*a*
14	11 1 3	19 27·92	0·050 *p*	52 32 15·8	0·65 *p*	3	*b*
18	10 10 47	28 26·60	0·053 *p*	50 37 57·5	0·56 *p*	6	*c*
21	9 38 5	35 43·69	0·052 *p*	49 10 45·5	0·47 *p*	3	*d*
28	9 9 29	14 55 10·91	+0·054 *p*	45 30 39·2	−0·42 *p*	3	*e*

p = Horizontal equatoreal parallax. The places are corrected for refraction.

Mean Places of Stars of Comparison.

Name.	R.A. h m s	N.P.D. ° ′ ″
a = B.A.C. 4797	14 22 5·68	53 7 59·9
b = — 4778	17 18·78	52 7 2·1
c = — 4812	26 4·84	51 2 17
d = Radcliffe Obs. vol. ix. No. 786	34 48·27	49 28 3·7
e = Lalande, No. 27447	14 56 32·22	45 42 20·5

Occultations of Stars by the Moon, observed at Ashurst, near Dorking. By Mr. Snow.

(Lat. 51° 15′ 58″ North; Long. 0h 1m 10s West.)

	Star.	Ashurst Sid. T. of Immersion. h m s	Limb.	Ashurst Sid. T. of Emersion. h m s	Limb.	
1850. Nov. 8	33 Capricor.	20 17 3·15	dark			
1851. Feb. 21	*n* Libræ	.....	...	16 32 8·7	dark	good.
Mar. 13	d^1 Cancri	8 44 15	dark	9 32 53	bright	good.
	δ Cancri	12 32 29·3	dark			
Sept. 14	845 B.A.C.	20 51 18	bright	22 49 2	dark	good.

Occultations of Stars by the Moon observed by Capt. Shadwell, R.N. F.R.A.S., at the Dockyard (Flag-Staff), Trincomalee.

Latitude of the Flag Staff, 8° 31′ 26″ North.

1851.		Mag.		Local M.T. h m s
July 12	*o* Sagittarii	4.5	Immersion	9 1 34·2
15	δ Capricorni	3.4	Emersion	15 39 41·1

A further memoir has been received from Mr. Maclear containing results of his comparison of the southern stars of the B.A.C. Catalogue with the heavens. The *observed* places depend upon from two to four observations with the 10-foot transit, and as many with the mural circle.

In assigning the probable source of error in Lacaille's catalogue, Mr. Maclear states that he has assumed, pretty freely, the likelihood of certain errors of reading off both the clock and instrument, which are of usual occurrence. This appears to him a more allowable process than to assign large proper motions. Probably, when his task is completed, the merely typographical errors of the *Cœlum Australe* may be got rid of by reference to the manuscripts.

If the zeal of the Cape astronomer and his assistants is supported by health and an adequate supply of labour, we may expect to have a Southern Catalogue, before long, on which we may rely.

Lord Wrottesley's Corrections of the British Association Catalogue.

Third List of Stars observed by Mr. R. Philpot, in which the Right Ascension differs by more than one Second in Time from that Catalogue.

B.A.C.	Excess of Observed Mean Place above B.A.C. s	No. of Obs.	B.A.C.	Excess of Observed Mean Place above B.A.C. s	No. of Obs.
1962	−7·50	5	6187	− 1·27	4
4550	−6·03	3	6531	− 1·26	4
5038	−1·26	2	6854	+ 1·35	3
5051	−1·19	3	7268	+10·43	3
5142	−1·61	4	7417	+ 1·53	4
5211	−1·32	5	7523	−60·81	4
5228	−2·71	5	7549	− 1·10	5
5767	+1·70	3	8083	+ 1·50	5
5910	+1·64	5	8372	+ 1·26	2

Note from Mr. Dawes.

"In the Supplemental Number (No. 9) of vol. xi. of the *Monthly Notices*, it is stated, in an 'Extract of a Letter from the Rev. John Slatter, dated June 26, 1851,' that 'there was an occultation of *Jupiter's* fourth satellite on June 20th, at about $16^h\ 30^m\ 30^s$ sidereal time at Rose Hill, not mentioned in the *Nautical Almanac*.'

"Mr. Slatter will, I am sure, excuse my stating that this is a mistake. The satellite passed the planet *without being occulted*. I watched it with my $8\frac{1}{2}$-foot achromatic up to $10^h\ 48^m$ Greenwich mean time, $= 16^h\ 42^m$ Greenwich sidereal time, when it had obviously passed its superior conjunction. I entered in my journal that 'at the time of its nearest approach, the satellite was about its own diameter from the edge of the planet; it is very small in appearance, about as bright as the star which *Jupiter* occulted on May 8th' (which was of the 8th magnitude).

"Mr. Slatter remarks, 'The lowness of the planet prevented my making a satisfactory observation.' The state of the air seems to have been much finer at Wateringbury than at Rose Hill; as I was able, some minutes after the nearest approach of the fourth satellite, to observe the internal and external contacts of the first satellite at its egress from the disc."

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